DEPARTMENT OF AGRICULTURE, BENGAL.

ANNUAL REPORT

OF THE

BANKIPORE AGRICULTURAL STATION

FOR THE YEAR 1910-1911.

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ANNUAL REPORT OF THE EXPERIMENTAL WORK OF THE BANKIPORE AGRICULTURAL STATION 1910-11.

Situation, soil, etc.— This station was established in 1903 and is situated in latitude 25° 37′ N. at about 183′ above sea level. The average annual rainfall in the neighbourhood is 44·5 inches and the crops depend partly on irrigation from the canal.

Table I gives the number of rainy days and the total rainfall for each month of the year under report.

TABLE I.

1910-1911—

Month and year.	No. of rainy days.	Amount in inches.
1910.		
April	1	0·15
May	2	0·46
June	17	10·63
July	25	12·01
August	19	8·70
September	19	16·05
October	7	7·59
November	2	0·57
December	Nil	Nil
1911.		
January	Nil	Nil
February	Nil	Nil
March	Nil	Nil
Total ...	...	56·16

The soil is a heavy, almost black, clay, typical of much of the land in Bihar on the south bank of the Ganges, and presents a marked contrast with the soil of the Gangetic alluvium on the north bank.

TABLE II.

PARTICULARS.	North of distributary surface soil.	North of distributary sub-soil.	South of distributary surface soil.	South of distributary sub-soil.
Insoluble matters ...	76·96	73·84	25·60	73·85
Potash	·82	·82	·80	·83
Soda	·82	·82	·50	·52
Lime	1·89	1·65	·82	1·32
Magnesia	1·38	1·96	·73	1·17
Iron aluminium ...	14·46	17·06	17·24	18 32
Phosphorous pentoxide ...	·25	·30	·17	·13
Sulphur trioxide ...	Trace	Trace	Trace	Trace
Carbon dioxide ...	Do.	Do.	Do.	Do.
Combined moisture and Organic* matters.	3 42	3·55	4·23	3·36
Total ...	100·00	100·00	100 09	100·00
* Containing Nitrogon ...	·070 per cent.	·055 per cent.	·065 per cent.	·043 per cent.

The analysis given in table II, which were made by the Agricultural Chemist at Sabour, show that the soil is fairly well provided with the elements generally considered necessary for fertility, but is not very rich in lime and is poor in sulphates. Like most Indian soils, this contains little organic matter and occasional green manuring may be expected to be profitable. An interesting experiment which it is hoped to try is that of applying to the land a small quantity of the sandy and highly calcareous soil from the north bank of the river and so improving both the physical character and composition of the soil at slight expense.

Season.—The heavy rain did severe damage to the main area of paddy, which gave an average outturn of only 12½ maunds per acre. The experimental plots, however, were not damaged, and the late rains facilitated autumn sowings.

Paddy experiments.—The chief crop on which experiments were tried was late, or *aman*, paddy, and the results are shown in tables III to IX.

Before commenting on the individual experiments, attention is drawn to the fact that the outturn of the duplicate plots on this farm, as shown in tables III, V, VI, VII and IX, are curiously equal, much mor so than one would expect considering the recent laying out of the farm. The results of the experiments on each set of plots are also extraordinarily consistent. It would therefore seem that the land is remarkably uniform, and it will be worth the Department's while to give very special attention to the paddy experiments carried out on this farm under such exceptionally favourable conditions as appear to obtain.

Seedling experiments.—Table III.—The table explains itself; two seedlings per hole seem to give the best outturn. The question of what number can be most profitably used in practical work on a large scale is a very difficult one, but it seems safe to say that a thin seedling of the seed bed is desirable, both on account of the sowing of seed and in order to produce stronger seedlings, which can be easily transplanted in smaller bunches than are commonly used.

TABLE III.

No. OF SEEDLINGS PLANTED.	Yield of grain in $\frac{1}{5}$th acre.	Yield of straw in $\frac{1}{5}$th acre.	Yield of grain per acre	Yield of straw per acre.
	MDS. S. C.	MDS. S. C.	MDS. S. C.	MDS. S. C.
One seedling per hole ...	5 15 6	11 19 0	26 36 14	57 15 0
Duplicate	5 9 0	11 15 7	23 5 0	56 37 3
Two seedlings per hole ...	6 19 0	14 2 4	32 15 0	79 11 4
Duplicate	6 16 4	13 30 0	32 1 4	68 30 0
Four seedlings per hole...	5 10 3	12 10 0	26 10 15	61 10 0
Duplicate	5 4 12	11 25 0	25 23 12	58 5 0
Eight seedlings per hole	5 35 0	12 35 0	29 15 0	64 15 0
Duplicate	5 23 4	13 15 0	27 36 4	66 35 0

Variety experiments.—Table IV.—In this experiment, in order to discount possible variations of fertility of the land, 50 maunds of cowdung were applied to each plot. Some of the fine Bengal varieties gave a very good outturn and it should be possible, after a year or two, to select one or two that will be more profitable for cultivation in the district than those that are more commonly grown at present. If the results of the season of 1911 confirm those of 1910, the number of varieties can probably be reduced in the coming year and the better ones grown on duplicate plots.

TABLE IV.

NAME OF VARIETY.	Yield of grain in $\frac{1}{5}$th acre.	Yield of straw in $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
	MD. S. C.	MD. S. C.	MD. S. C	MD. S. C.
Baitarni ... Local, coarse ...	6 15 2	13 20 0	31 35 8	67 20 0
Bansful ... Fine ..	6 3 3	12 37 4	30 16 0	64 26 4
Kapursary ... Medium, local ...	3 22 9	7 30 0	21 15 9	38 30 0
Banktulsi ... Very fine ..	6 7 0	11 1 3	25 35 0	55 5 15
Kalamdan ... Gaya, coarse ...	6 16 0	13 30 0	32 0 0	68 30 0
Bhadshabhog Very fine ...	3 35 0	7 37 0	19 15 0	39 25 0
Shapasand ... Ditto ...	5 0 4	11 25 0	25 1 4	58 5 0
Marna .. Gaya, medium ...	5 26 7	3 4 0	28 12 3	65 20 0
Dhania ... Ditto ...	4 1 0	9 35 0	20 5 0	49 15 0
Ramsal ... Burdwan, fine ...	3 28 15	9 30 0	18 24 11	38 30 0
Sumudrabali Very fine ...	4 23 0	9 35 0	22 35 0	49 15 0
Hatisal ... Fine ...	5 27 0	10 8 0	28 15 0	51 0 0
Khirajali ... Chalam, very fine	6 1 0	12 27 0	30 5 0	63 5 0
Samjira ... Local, fine ...	4 8 6	9 5 0	21 1 14	45 25 0
Dadkhani Very fine ...	6 7 2	13 1 0	30 35 8	65 5 0
Maharaja ... (Shahabad) coarse	5 37 1	12 3 0	29 25 5	60 15 0

Manurial experiments.—The experiments shown in table V were tried on the coarse local variety of paddy called Baitarni. The table shows the manurial applications to have been remarkably successful with the exception of "raiyats cowdung" and of "bonemeal and saltpetre," the increase from which latter combination, though considerable, was not enough to pay for the manure.

TABLE V.

NAME OF MANURES APPLIED PER ACRE.	Yield of grain per $\frac{1}{5}$th acre.	Yield of straw per $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
	MLS. S. C.	MDS. S. C.	MDS. S. C.	MDS. S. C.
100 maunds Cowdung (Farm pitted).	6 22 5	13 4 0	32 31 9	65 20 0
Duplicate ...	6 20 0	13 2 0	32 20 0	65 10 0
50 maunds Cowdung (Farm pitted).	5 2 0	10 19 0	25 10 0	52 15 0
Duplicate ...	5 0 0	9 35 4	25 0 0	49 16 4
50 maunds Cowdung (Raiyat).	3 33 10	8 1 0	19 8 4	40 5 0
Duplicate ...	3 27 5	7 35 0	18 16 9	29 5 0
3 maunds Bonemeal and 1 maund Saltpetre.	4 35 0	9 35 4	24 15 0	49 16 4
Duplicate ...	4 29 8	9 30 0	23 27 8	48 30 0
6 maunds Castor Cake ..	6 10 0	12 35 0	31 10 0	64 15 0
Duplicate ...	6 9 0	12 30 0	31 5 0	61 30 0
Green manuring with Dhaincha.	5 10 4	9 21 0	26 11 4	47 25 0
Duplicate ...	5 8 2	9 1 0	26 0 10	45 6 0
Unmanured	3 3 0	7 17 0	15 15 0	37 5 0
Duplicate ...	3 10 0	8 2 0	16 10 0	40 10 0

The application of 100 maunds of farm cowdung and of 6 maunds of castor cake was so successful as to warrant the use of one or other of these manures on every non-experimental plot of the farm that cannot be green manured. On these plots, the second 50 maunds of cowdung have produced exactly the increase one would have expected instead of producing no appreciable increase as has been the case on other farms in the province, but it may be remarked that in the variety experiments (Table IV), 50 maunds of cowdung produced 6 maunds per acre of "Baitarni" paddy more than the same amount applied on the manurial plots, and it is possible that these manurial plots were in exceptionally poor condition.

Green manuring experiment.—Table VI shows exactly the same advantage in manuring with *dhaincha* as was shown by the plot in the general manurial series (table V). Sann-hemp produced a slightly larger crop which would more than pay for the greater cost of the seed. Both green manures are apparently profitable on this soil if water is available for sowing purposes in May or early June.

TABLE VI.

NAME OF EXPERIMENT.	Yield of grain in $\frac{1}{5}$th acre.	Yield of straw in $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
	MDS. S. C	MDS. S. C.	MDS. S. C.	MDS. S. C.
Green manuring with saun-hemp.	5 22 0	11 14 0	27 30 0	56 30 0
Duplicate	5 20 8	11 10 5	27 22 8	56 11 9
Green manuring with dhaincha.	5 14 9	9 30 0	26 32 13	48 30 0
Duplicate ...	5 17 5	11 3 4	27 6 9	55 16 4
Unmanured	3 20 0	7 26 0	17 20 0	38 10 0
Duplicate	3 10 0	7 6 0	16 10 0	35 30 0

The plough experiments.—Show an advantage in outturn from the use of furrow-turning ploughs, the magnitude of which it is difficult to account for.

TABLE VII.

NAME OF EXPERIMENT.	Yield of grain in $\frac{1}{5}$th acre.	Yield of straw in $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
	MDS. S. C.	MDS. S. C.	MDS. S. C.	MDS. S. C.
Experiment with Hindustan plough.	5 37 0	10 7 0	29 25 0	50 35 0
Duplicate	5 33 7	10 2 8	29 7 3	50 12 8
Experiment with Meston plough.	5 32 12	11 20 0	29 3 12	57 20 0
Duplicate	5 31 4	11 27 0	28 36 4	58 15 0
Experiment with Sibpur plough.	4 11 6	8 20 0	21 16 14	42 20 0
Duplicate	4 7 3	7 37 0	20 35 15	39 25 0
Experiment with local plough.	4 0 0	10 0 0	20 0 0	50 0 0
Duplicate	3 38 0	8 5 0	19 30 0	40 25 0

Soluble salts.—Sulphate of magnesia was applied in varying quantities in October on three plots as shown in Table VIII(*a.*)

TABLE VIII*a.*

No.	Variety of paddy.	NAME OF MANURES APPLIED.	Yield of grain per $\frac{1}{5}$th acre.	Yield of straw per $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
			MDS. S. C.	MDS. S.	MDS. S. C.	MDS. S.
1	Dadkhani.	Unmanured ...	4 20 0	10 16	22 20 0	52 0
2		One maund sulphate of magnesia.	6 0 0	15 0	30 0 0	75 0
3		Two maunds sulphate of magnesia.	7 13 1	18 12	36 25 5	91 20
4		Three maunds sulphate of magnesia.	7 6 0	18 0	35 30 0	90 0

The apparently consistent and very remarkable results (the yield of fine paddy on the third and fourth plots was greater than that of any other paddy on any of the other manurial plots) are possibly partly due to variation in the fertility of the plots. Sulphate of magnesia is a cheap salt not usually regarded as a manure, particularly on land like this, which already contains an excess of magnesia, and it is

difficult to believe that so large an increase as 14 mds. of grain and nearly 40 of straw per acre could take place as the result of any manure in the short remaining growing period after the manures were put on. However, there may be some biological significance in the result, and the experiment is worth repeating on a large number of duplicate plots. It should be noted that, judging from the yield of the unmanured plot, the land was already in fair condition.

The results shown in table VIII(*b*), obtained with manures of generally accepted value, but also applied in October, are perhaps not so remarkable as those of the experiments with magnesia, but the great difference between the first and last plots can hardly have accrued between October and harvest as the result of the manures alone. It may also be noted that bonemeal and saltpetre combined, applied at an earlier date, did not give so great an increase (table V) as the saltpetre alone in this experiment.

TABLE VIII(*b*)

Variety of paddy.	Name of manures applied.	Yield of grain per $\frac{1}{5}$th acre.	Yield of straw per $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
		Mds. s. c.	Mds. s. c.	Mds. s. c.	Mds. s. c.
Morwa.	Unmanured ...	3 20 1	7 35 0	17 20 5	39 15 0
	1 md. of sulphate of ammonia.	5 8 0	12 5 0	26 0 0	60 25 0
	1 md. saltpetre ...	5 20 0	13 5 0	27 20 0	65 25 0
	2 mds. superphosphate and 1 md. sulphate of ammonia.	6 10 0	13 35 0	31 10 0	69 15 0
	2 mds. superphosphate and 1 md. saltpetre.	6 22 0	14 25 8	32 30 0	73 7 8

The superphosphate, though giving an increase, did not pay for itself.

The seedrate experiments.—With broadcasted paddy (table IX) indicates that there is no advantage in sowing more than 30 seers per acre of this variety in land of moderate fertility in a favourable season ; but ten seers more produced the same outturn, and under normal circumstances, the heavier seeding is perhaps safer.

TABLE IX.

QUANTITY OF SEEDS SOWN PER ACRE.	Yield of grain in $\frac{1}{5}$th acre.	Yield of straw in $\frac{1}{5}$th acre.	Yield of grain per acre.	Yield of straw per acre.
	MDS. S. CH.	MDS. S. CH.	MDS. S. CH.	MDS. S. CH.
40 seers seeds per acre ...	4 8 12	9 21 8	21 3 12	47 27 8
Duplicate ...	4 8 0	9 15 0	21 0 0	46 35 0
30 seers seeds per acre ...	4 9 0	10 21 0	21 5 0	52 25 0
Duplicate	4 7 0	10 20 0	20 35 0	52 20 0
20 seers seeds per acre ...	2 23 0	6 19 8	12 0	32 17 8
Duplicate ...	2 21 0	6 12 8	12 25 0	31 23 8
15 seers seeds per acre ...	1 37 0	4 32 0	9 25 0	24 0 0
Duplicate ...	1 36 0	4 32 8	9 20 0	24 2 8

II.—SUGARCANE.

Manures in kinds and quantities, according to the table X below, were compared upon the Khari variety of cane. Whole canes were planted, end to end, in trenches $2\frac{1}{2}'$ wide, separated by ridges $2\frac{1}{2}'$ wide, two rows of canes $2'$ apart being planted in each trench in the month of January 1910. The crop was harvested in December 1910. The land received the following treatment :—

(*a*) Ploughings—10 (2 each in August, September, October, November and December).
(*b*) "Beamings"—4 (2 in November and 2 in December).
(*c*) Irrigation—10 (1 in January, 1 in February, 3 in March, 2 in April and 3 in May).
(*d*) Hoeing with Kodalies (one after each irrigation, from January to May).
(*e*) Weedings—Nil.
(*f*) Earthing—1 in May.

All the cowdung and sulphate of potash, and two-thirds of the castor cake and other chemical manures, were applied in the trenches just before planting, while the remainder was applied round the roots of the plants before earthing them up.

TABLE X.

	NAME OF MANURES APPLIED PER ACRE.	Yield of cane per $\frac{1}{5}$th acre.	Yield of juice per $\frac{1}{5}$th acre.	Yield of *gur* per $\frac{1}{5}$th acre.	Yield of *gur* per acre.
		MDS. S.	MDS. S. CH.	MDS. S. CH.	MDS. S.
1	200 mds. cowdung ... 8 „ castor cake	128 15	75 2 0	10 37 0	54 25
2	100 „ cowdung ... 2 „ sulphate of ammonia 2 „ sulphate of potash. 3 „ superphosphates.	124 3	72 11 0	10 28 0	53 22
3	100 „ cowdung ... 2 „ sulphate of ammonia. 3 „ superphosphates	96 24	56 2 0	8 2 0	40 10
4	100 „ cowdung ... 2 „ sulphate of potash.	63 5	35 8 8	5 0 0	25 0
5	100 „ cowdung ... 3 „ superphosphates.	65 12	38 0 0	5 34 6	29 12
6	2 „ sulphate of ammonia 3 „ superphosphates. 2 „ Sulphate of potash.	98 10	59 0 0	6 15 0	31 35
7	100 „ cowdung. 3 „ superphosphates. 2 „ saltpetre	75 20	44 0 0	8 3 0	40 15
8	Unmanured ...	63 18	31 22 0	4 17 0	22 5

The scheme is somewhat complicated.

Sulphate of potash, when used in conjunction with other soluble manures, appears to have had a decided effect. Judging by the yield of *gur* compared with that of juice on plot 7, the saltpetre appears to have improved the quality of the juice more than the quantity; but it was applied too early, and too much reliance cannot be placed on the figures for *gur*, in the manufacture of which an indefinite

amount of loss occurs, nor on the outturn of an isolated plot for one year. The simplification of the scheme, by the addition of sulphate of ammonia on plots 4 and 5 and the substitution of sulphate of potash for saltpetre on plot 7—thus comparing the effect of omitting each element of a complete manure in turn, is desirable.

Other Crops.—In addition to paddy and sugarcane, small areas of cotton and cassava were grown: the cotton failed entirely owing to water-logging; the cassava was used for propagation on a larger area for further trial.

Jowar (Sorghum) was grown for making silage, as in previous years The crop was cut in September 1910 when the grain was in the milk stage. The maximum yield on an acre was 525 maunds (19 tons) and the siloh holds 140 tons. The analysis (table XI) made by the Agricultural Chemist at Sabour shews the composition of the product.

TABLE XI.

Moisture	64·42
Acetic acid	1·59
Lactic acid	1·08
Ash	5·51
Albuminoids	1·01
Amide nitrogen	0·03
Digestible fibre	13·04
Woody fibre	13·08
Undetermined	0·24
Total ...	100·00

Mr. Taylor remarks: "A good sample of acid silage, apparently made from juar. It contains large quantities of volatile acid, which gives it a very sour but not disagreeable smell, and also a high percentage of non-volatile acids The albuminoid content is good."

The bullocks ate the silage with avidity and improved in condition.

Of cold weather crops, white (Patna) peas, gram and *khesari* (lathyrus sativas) are the most important on this farm; no experiments were tried with them. Wheat and barley were grown on a small scale, but did not give a satisfactory outturn.

Management.—The station is in the immediate charge of Babu Siva Das Banerjee, who supplied the information on which this report is based.

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